REMARKS

Claims 1, 3-9 and 11-28 are pending in the application. Reconsideration of the claims is respectfully requested.

Applicant thanks the Examiner for indicating that claims 1, 3-9 and 11-20 are allowed.

Claim Objection

Claim 25 was objected to for containing an informality. In particular, it is stated in the Office Action that independent claim 25 recites a first waveguide and a second waveguide is not mentioned in the independent claims. Applicant respectfully points out that just because the waveguide is referred to as a "first waveguide" does not require that a second waveguide be present. Accordingly, there is no informality.

Claim 25 has been amended, however, to insert a word that was omitted by error when originally submitted. This amendment to claim 25 was not made for reasons of patentability and does not narrow the scope of the claim. Claims 26-28 have been amended to correct their dependence to depend from claim 25.

Rejection Under 35 U.S.C. § 103(a)

Claims 21, 24, 25 and 28 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Alferness et al. (U.S. Patent No. 5,253,314) (Alferness) in view of Osinski et al. (U.S. Patent No. 6,421,363) (Osinski). It is stated in the Office Action that Alferness shows in FIG. 1 a first waveguide (16), a second waveguide (18), a distributed Bragg grating and an electrode disposed proximate the first waveguide. It is further stated that Alferness lacks the amplifying material having a composition different from the composition of the first waveguide (16), but that Osinski teaches, in Figs. 1 and 2 the amplifying material (6) having a composition different from the composition of the first waveguide (16). It is also stated that it would have been obvious for one of ordinary skill in the art at the time the invention was made to provide Alferness with Osinski's different amplifying material for the benefit of amplifying light.

Applicant disagrees with the characterization of the references presented in the Office Action. First, Alferness does not teach a distributed Bragg grating as is asserted in the Office Action. Instead Alferness teaches a vertical coupler filter section (10) which is shown in Fig. 1 to contain a grating. This grating is used to enhance the optical coupling of light between the two

waveguides (16 and 18), but does not reflect light in the manner of a distributed Bragg grating. The grating is described by Alferness, at col. 3, lines 36-38, as being a coarse phase-matching grating having a period Λ. Alferness further states that because of the different effective refractive indices of the two waveguides, the overlay of the mode in each respective waveguide is small, and so light does not normally couple between the two waveguides. However, efficient codirectional coupling between two waveguides can be obtained with a periodic coupling coefficient of the period Λ. (col. 3, lines 55-62). Therefore, the grating is useful for enhancing optical coupling between the waveguides. Alferness further states that the interaction length needed for complete coupling between the two waveguides is dependent on the waveguide separation and the grating depth. (col. 3, lines 66-68). In col. 4, lines 40-50, Alferness teaches that the tuning enhancement achievable with his vertical coupler filter laser is about a factor of 12 higher than compared to a distributed Bragg reflector laser. Thus, contrary to the statement in the Office Action, Alferness teaches that the grating in the vertical coupler filter section (10) of his laser is not a distributed Bragg grating, but is a phase matching grating to enhance the coupling between waveguides in the vertical coupler.

Furthermore, Alferness teaches that the light in the lower waveguide is reflected within his laser at a high reflection coating provided at the rear facet (20) of the laser. (col. 3, lines 31-33). Nowhere does Alferness teach or suggest that a Bragg grating is used to reflect light in his vertical coupler filter laser.

Turning now to Osinski, it is stated in the Office Action that Osinski teaches the amplifying material (6) having a composition different from the composition of the first waveguide. Applicant respectfully disagrees with this description of Osinski. Osinski teaches a "stack of semiconductor layers 4 that includes a p-n junction" (col. 8, lines 32-33, Fig. 1) and "light waves generated in the active region propagate in an optical waveguide formed in the transverse direction (the X direction in FIG. 1) by the stack of layers 4" (col. 8, lines 56-58). Reference to FIG. 1 shows that the X direction is the vertical direction in the semiconductor laser, perpendicular to the layers of the stack (4). Osinski does not specify which layers are waveguiding layers and which layers provide optical amplification. If there can be any inference from Osinski's description, it is that the active medium forms at least part of the waveguide, since the light generated within the active medium is taught to be confined by the waveguide. Thus, the material of the first waveguide would include the amplifying material.

Osinski's pumped active region (6), alleged in the Office Action to be an active medium different from a waveguide medium, is actually taught to be that region of Osinski's laser device that lies under the electrical contact (2) (col. 8, lines 41-43), and is that portion of laser through which current flows. This is not inconsistent with Osinski's teaching that the active medium is in the stack of semiconductor layers: the current from the contact passes through the stack of semiconductor layers (4), in a direction perpendicular to the layers, and thus passes through the active medium in the stack and the waveguide in the stack. Applicant does not understand how Osinski's "pumped active region", which merely describes an area of the device that is pumped, can reasonably be construed to indicate the active medium is formed of a different composition than the waveguiding material.

<u>Claims 21 and 24</u>

Claim 21 is directed to a tunable optical filter that includes a first waveguide formed from a first waveguide material and a second waveguide disposed parallel to and proximate the first waveguide so as to form a directional coupler filter. An amplifying material, having a composition different from the composition of the first waveguide material, is disposed in a parallel relationship proximate the first waveguide so as to be capable of amplifying light at the same time as the light propagates along the first waveguide of the directional coupler filter.

Three criteria must be met to establish a *prima facie* case of obviousness. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference. Second, there must be a reasonable expectation of success. Finally, the prior art reference, or combination of references, must teach or suggest all the claim limitations. MPEP § 2142. Applicant respectfully traverses the rejection since the prior art fails to disclose all the claim limitations and there would be no motivation to combine the references as proposed by the Examiner.

Alferness teaches a laser having a gain section (12) and a vertical coupler section (10) that provides tuning to the laser. The vertical coupler section includes an upper waveguide (16) and a lower waveguide (18). Light enters the vertical coupler section from the active region along the upper waveguide and, if the light falls within a selected bandwidth, the light is coupled into the lower waveguide. The coupled light is reflected at the high reflection coating at the rear fact (20), and is coupled back into the upper waveguide to be returned to the active section. Therefore, the

laser cavity is formed between upper waveguide at the reflective facet (19) of the active section and lower waveguide at the rear facet (col. 4, lines 62-66). The light that does not fall within the selected bandwidth passes is lost out of the end of the upper waveguide at the mode stripper section (14) (col. 5, lines 4-9). The laser is tuned by applying a voltage to the contact above the vertical coupler filter, which changes the effective index difference between the two waveguides (col. 5, lines 33-37). It is important to note that Alferness specifically teaches that the multiple quantum well active layer is not present in the vertical coupler section, only in the active section (col. 3, lines 11-20).

As has been discussed above with regard to Osinski, Osinski does not teach or suggest that the amplifying material is different from the first waveguide material. If anything, Osinksi suggests that the amplifying material is within the first waveguide, thus making the amplifying material the same as the first waveguide material. Therefore, the proposed combination of references fails to teach or suggest all the elements of the claim.

Furthermore, Applicant respectfully disagrees that there is sufficient motivation to combine the references. The alleged motivation set forth in the Office Action is "for the benefit of amplifying the light beam." This is merely a restatement of an inherent property of an amplifying material.

The invention of claim 21 is directed to the provision of amplifying material in a coupler filter having two waveguides side by side so that the light is amplified as it propagates within the first waveguide of the coupler filter.

Alferness teaches the use of a coupler filter to tune a laser, but his laser has separate gain and filter sections: Alferness specifically teaches that the amplifying material was omitted from the coupler filter section when the device was fabricated (col. 3, lines 11-20). There is nothing in Alferness that teaches or suggests any reason to provide amplification in the coupler filter section.

Osinski teaches a semiconductor laser that is formed between two facets (9 and 10). The active region includes a broad area stripe, which is known to produce problems of multiple mode operation and broad divergence (col. 1, line 18 – col. 2, line 67). Osinski's invention introduces an angled grating (8) to provide mode and divergence control. Osinski does not teach or suggest the use of a filter coupler, nor does Osinski teach or suggest any reason for adding amplifying material to a filter coupler.

There must be some actual *motivation* to combine the references found in the references themselves, the knowledge of one of ordinary skill in the art or from the nature of the problem to be solved that would suggest **the combination**. Without a suggestion of the desirability of "the combination," a combination of such references is made in hindsight, and the "range of sources available, however, does not diminish the requirement for actual evidence." *In re Dembiczak*, 50 USPQ2d 1614 (Fed. Cir. 1999). It is a requirement that actual evidence of a suggestion, teaching or motivation to combine prior art references be shown, and that this evidence be "clear and particular." *Id.* Broad conclusory statements regarding the teaching of multiple references, standing alone, are not evidence. *Id.* For example, it is respectfully submitted that both references fail to teach or suggest anything whatsoever to do with adding amplifying material to a coupler filter. There is no discussion in Osinski even addressing coupler filters. No "clear and particular" evidence of motivation to combine can be identified.

The examiner must show some objective teaching leading to the combination. *In re Fine*, 837 F.2d 1071, 1075, 5 USPQ2d 1596, 1600 (Fed. Cir. 1988). There is no such objective teaching in either reference and it is respectfully submitted that the Examiner has pieced together aspects purportedly found in the prior art to arrive at the invention through hindsight. As stated by the Federal Circuit:

> "Combining prior art references without evidence of such a suggestion, teaching, or motivation simply **takes the inventor's disclosure as a blueprint for piecing together the prior art to defeat patentability–the essence of hindsight.**"

In re Dembiczak, 50 USPQ2d 1614, (Fed. Cir. 1999) (*citing Interconnect Planning Corp. v. Feil*, 774 F.2d 1132, 1138, 227 USPQ 543, 547 (Fed. Cir. 1985); emphasis added).

Accordingly, since the proposed combination of references fails to teach or suggest all the elements of claim 21, and since there is no motivation to combine the references in the manner suggested, the *prima facie* case of obviousness fails, and the claim is allowable over the proposed combination of references.

Claim 24 depends from claim 21 and is therefore also allowable.

Claims 25 and 28

The invention of claim 25 is directed to a first waveguide formed from a first tunable waveguide material, the first waveguide having an input to receive input light. A distributed

Bragg grating is disposed proximate the first waveguide so as to form a distributed Bragg reflector (DBR) filter that reflects light propagating along the first waveguide at a selected wavelength. The reflected light passes out of the first waveguide at the input. An electrode is disposed proximate the first waveguide, the selected wavelength being variable according to an amount of current passing through the first waveguide from the electrode. An amplifying material has a composition different from the composition of the first tunable waveguide material and is disposed in a parallel relationship proximate the first waveguide so as to be capable of amplifying light at the same time as the light propagates along the first waveguide when a current passes from the electrode through the amplifying material.

The proposed combination of references fails to teach all the elements of claim 25. In particular, neither reference teaches putting amplifying material beside a distributed Bragg grating. Alferness's laser does not include a distributed Bragg grating, as has been discussed above. Instead, Alferness teaches that his laser includes a phase match grating.

Osinski also fails to teach or suggest that the grating (8) in his laser is a distributed Bragg grating used as a DBR. For example, Osinski states "the grating tilt angle and period are chosen such that any wavelength within the optical gain bandwidth will be <u>out of Bragg resonance</u> with the grating" (col. 6, lines 8-11, emphasis added) and "the grating period and orientation are chosen so that <u>Bragg resonance conditions are not met</u> for any of the light beams that propagate in the optical waveguide (col. 6, lines 33-35, emphasis added).

Osinski does teach the use of a Bragg grating as a DBR (1220, 1221, col. 16, lines 65-67), but this is only in the context of using a DBR laser as a single frequency laser that injects tunable, single frequency light into the broad area laser, in a master oscillator, power amplifier (MOPA) configuration. There is no teaching or suggestion that the DBR has a Bragg grating with amplifying material beside it.

Furthermore, Applicant respectfully disagrees that there is sufficient motivation to combine the references. The alleged motivation set forth in the Office Action merely restates an inherent property an amplifying material. The invention of claim 21 is directed to the provision of amplifying material beside the distributed Bragg grating of a distributed Bragg reflector (DBR).

Alferness's only reference to DBR lasers is to discuss the shortcomings of the tunability a DBR laser and to compare the tenability of this coupler filter-tuned laser to that of a DBR laser. There is nothing in Alferness to teach or suggest the addition of an amplifying medium to a DBR.

Osinski teaches a semiconductor laser that is formed between two facets (9 and 10). The active region includes a broad area stripe, which is known to produce problems of multiple mode operation and broad divergence (col. 1, line 18 – col. 2, line 67). Osinski's invention introduces an angled grating (8) to provide mode and divergence control. Although Osinski does teach the use of a DBR, this is used in a laser oscillator that injects tunable, narrowband light into the higher power, broad area laser. There is nothing to suggest that there is amplifying material disposed beside the grating of the DBR. The examiner must show some <u>objective teaching leading to the combination</u>. *In re Fine*, 837 F.2d 1071, 1075, 5 USPQ2d 1596, 1600 (Fed. Cir. 1988). There is no such objective teaching in either reference.

Accordingly, since the proposed combination of references fails to teach or suggest all the elements of claim 25, and since there is no motivation to combine the references in the manner suggested, the *prima facie* case of obviousness fails, and the claim is allowable over the proposed combination of references.

Claim 28 depends from claim 25 and is, therefore, also allowable. Furthermore, claim 28 is directed to the distributed Bragg grating comprising sections of grating material, and the amplifying material being disposed as sections beside respective sections of the grating material. There is nothing in either reference to teach or suggest that a grating is formed using sections of grating material or the use of sections of amplifying material beside the sections of grating material.

Conclusion

It is believed that all pending claims are in condition for allowance. Applicant respectfully requests favorable reconsideration and early allowance of all pending claims.

If a telephone conference would be helpful in resolving any issues concerning this communication, please contact Applicant's attorney of record, Iain A. McIntyre at (612) 436-9610.

Respectfully submitted,

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